Introduction

The following experimental design is made to understand how the degree of optimism affect trending on certain stock price (An upward trend is defined as three consecutive rises in stock price and a downward trend is defined as three consecutive falls). However, there are two major constraints for conducting a field experiment to answer this exact question. First, the price of actual publically-traded stocks is determined by hundreds of thousands of investors in the market so change of behaviors of some selected participants may not be observable. Also, making perturbations that may influence investment decisions seems unethical. Thus, we instead plan to study how investors' investment decisions would be influenced by positive information and others' opinions with regards to a company that is not publicly-traded in the US.

Experimental Design

The main component of the experiment is a digitally-empowered in-lab experiment. We can construct an ongoing assignment for students at University of Chicago enrolled in a 8-weeks course or seminar where the main theme is investment strategy and/or fundamental research. If there is no such course, we can try to partner with a faculty to open one. All students enrolled in this course would be the participants of this experiment. The students are grouped into three sections: students in section 2 and 3 are the experimental groups who receive positive reviews or commentaries of company A apart from the quarterly or annual reports when designing their investment strategy and students in section 1 would be the control group where no additional information is given.

After some exposure to basic investment knowledge students in all three sections will be asked to read materials (brief introduction to the company and a recent annual report) on a small-sized publicly-traded (between 500 million and 2 billion USD market cap) company (Company A) that is in a small scale industry (so students are less likely to get information from other sources) and write about their initial investment assessments about this company. We will encrypt the name of the company in the readings and limit the students to read only the provided materials to make investment decisions. The assessments should include whether they want to long or short the company and their reasons.

Later, students in section 2 and 3 would be assigned with mandatory bi-weekly reading materials about company A that include mostly positive news and reviews of company A. Besides the assigned readings, every week one student from section 3 will be asked to write a critical response to the readings, open a new thread on some online class portals (E.g. section-specific Piazza or github page, etc.) and post his response there. Other students in section 3 will be asked to respond to his post by defending the original positive readings. Such process will essentially reinforce the influence brought by the readings. Furthermore, this process should mimic the action of posting positive Tweets or comments by investors online. In the end of the course, we will provide the students in all sections with a more recent quarterly report of company A. We will also provide a brief description and quarterly report of another company, company B, of which the stock has very similar post-earning price movement and volume compare to company A. Students in all sections would be required to write investment assessments of company A and B with the given information.

By receiving extra positive reviews of company A, the level of optimism of students in section 2 and 3 should rise. We can compare the percentage of long positions given to company A by the

students in section 1 to students in section 2 and 3 in the final assessment and normalize the comparison with the percentages observed in the initial assessment. If the normalized percentage of long positions given by students in section 2 and 3 is higher than that of section 1, we may conclude that the participants have been indeed influenced by the positive information in the readings (optimisms expressed in the readings). If there is higher percentage given by students in section 3 then section 2, we may further conclude that the participants who have written positive commentaries about a company actually are more likely to long this company.

We can also conduct a within-subjects comparison by looking at the how students in section 2 and 3 rate company A and company B differently. Since the price movement after the release of the quarterly reports of both company (let's assume the information given by conference call is included in quarterly reports as well) are similar, the expectation of the future performances of the two companies should also be similar in an efficient market. If more students think they would long company A then company B, then we may conclude that the readings and the optimism conferred by those readings have influenced the participants to make different investment decisions regardless of similar fundamental factors. The experimental design is illustrated in the following table:

Student Group	Treatment
Section 1 (Control)	No Weekly Readings + 1 Annual Report + 2 Quarterly Reports
Section 2	Bi-Weekly Reading Materials + 1 Annual Report + 2 Quarterly Reports
Section 3	Bi-Weekly Reading Materials + Peer Responses +1 Annual Report + 2 Quarterly Reports

The experiment utilizes digital systems to recruit participants and deliver treatment. Students would sign-up for the course or seminar using some student information system, the assigned readings would be delivered to them through some formats of online class portal or workplace and the student responses in section 3 would be posted on forum/ discussion platforms of the online class portal or online blogs like WordPress. There may be ethical concerns about setting up such a course, but we can inform the students of the research nature of this course and ask for their consent. Lastly, students' performance would be graded by their class participation and logic shown in the investment assessments based on the materials given to them. Whether their analyses are de facto right or wrong is not important.

Analysis of Validity

Depending on the number of students enrollment, statistical conclusion may not be met with just one experiment cycle. Assuming 20 students would enroll and stay for each section on average, this gives us 60 total participants total: the sample size may be too small. However, this same experiment can be repeated multiple semesters to generate a larger sample.

Regarding internal validity, since this proposed experiment is more of a lab experiment, we have more control over the delivery and measurement of the outcomes. In terms of delivery, we expect most students to read the assigned readings since their written response is required for course completion. Further, with respect to measurement, we keep records of each student's two investment assessments in which the students provide definitive categorical opinions about the two companies (long or short). Furthermore, we can ask the students for estimated target price in the

next experiment cycle if we find the categorical data is not quantitative or distinguishable enough. Also, to ensure the randomization of the recruitment process, we make this class elective and open to all junior and senior students interested in investment and finance. We use this frame population to represent potential investors in the market; since there is no control over the recruitment process, the participants would randomly come from the frame population. This frame population would match the real market since the enrolled students should be interested in investment.
Construct validity is not a concern for this study because the treatments and outcomes are analogical. These treatments and outcomes are deliberately designed to perturb the participants' optimism about a company. External validity may be difficult to justify because conducting such an experiment is time-consuming and challenging due to regulatory barriers. However, this experiment is replicable at different universities. It is also possible to pair this experiment with a fully digital field experiment such as in the study of Correll, Benard, and Paik (2007) on "Motherhood Penalty".

Internal VS. External Validity

As stated above, it is difficult to perturb and observe investors' behaviour in the market, so we have proposed a deliberately designed lab experiment. We want to be able to more directly study the causal mechanism between two levels of optimism and participants' investment behaviors by designing the two specific treatments for participants in section 2 and 3. These designs will be pointless if we cannot ensure that the participants actually have absorbed the optimisms written in the readings. By turning a course into an experiment, we can use class participation points to motivate students to get exposed to optimistic information about a company (section 2) or generate optimistic commentaries themselves (section 3). All these designs require strong internal validity while external validity is sacrificed due to the reasons mentioned in the last paragraph.

Heterogeneity of Treatment

People with different experience in finance and risk profiles react differently to optimism (positive information). Enrolled students will have different backgrounds and prior knowledge to the topic of the course and thus an environment of heterogeneity of treatment for this experiment is well set. A "quiz 0" given at the beginning of the course can be used to survey each student's experience in finance and risk profile and we can later use this information to divide the students into sub-groups.

Causal Mechanisms

The design of this experiment is a mixed-design that combines the improved precision of within-subjects designs and the protection against confounders of between-subjects designs. Comparison between students in section 1 and in section 2 and 3 is the between-subjects part. The comparison between the investment assessments of students in section 2 and section 3 before and after the duration of the course (treatment with positive information to promote optimism) exemplifies a within-subjects design. Also, between section 2 and section 3 the treatment is slightly altered so we can differentiate the effect of optimism that is passive (section 2, lower degree of optimism, which mimics the investors who just receive positive information from others) and optimism that is active (section 3, higher degree of optimism, which mimics the investors who would express their optimism online, e.g. on Twitter or some online forums). Using the combination of mixed-design and alteration of treatment, we shall be able to study causal mechanism between investor optimism and their investment judgements.